

Appl. No. 10/661,793
Amdt. dated 06/15/2006
Response to Office Action of 03/22/2006

Attorney Docket No.: TS01-1037
N1085-90149

REMARKS/ARGUMENTS

Claims 8-14 were previously pending in this application. Claims 12-14 have been allowed and claims 8-11 rejected. Claims 8 and 9 are hereby amended and claims 15-17 newly added. Applicants respectfully request re-examination, reconsideration and allowance of each of pending claims 8-11 in addition to previously-allowed claims 12-14 and allowance of each of claims 8-17.

Applicants and their undersigned representative thank the Examiner for the detailed analysis, comments and figures from the referenced documents that were embedded in the Office Action and which proved very helpful. Applicants also acknowledge the Examiner for providing commentary, beginning on page 6, with respect to the Applicants' previous arguments, filed on 17 January 2006, with respect to the Wu and Lymberopoulos references.

I. Allowable Subject Matter

Applicants further thank the Examiner for indicating, on the bottom of page 5 of the Office Action, that claims 12-14 have been allowed.

II. Rejection of Claims 8-11 Under 35 U.S.C. § 102(e)

On page 2 of the Office Action, claims 8-11 were rejected under 35 U.S.C. § 102(e) as being anticipated by Sedigh et al. (U.S. Pat. No. 6,893,974), hereinafter "Sedigh". Applicants respectfully submit that the present claim rejections based on the Sedigh reference are overcome for reasons set forth below.

Amended independent claim 8 recites the features of:

means, including a feedback mechanism, for assuring that an obtained critical dimension measurement of said opening created through said layer of etch resist material is within design specification.

Critical dimension measurements of openings formed in resist material after develop and prior to etching are commonly referred to as ADI-CDs (after develop

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inspect CDs). Amended independent claim 8 recites the feature that the invention provides means for creating an opening through a layer of etch resist material and assuring that the obtained critical dimension measurements of this opening, i.e. ADI-CD's, are within design specifications, i.e. means for producing ADI-CDs that are within design specification. Sedigh, in contrast, does not.

Sedigh, as in FIG. 9, merely accepts whatever "process pre-etch values", i.e., ADI-CDs, that are received and, based on whether the values are within a target value, either:

A) etches wafers without adjustment of etch parameters 96 (yes); or

B) adjusts one or more etch parameters 98 (no).

Sedigh makes no provision for actually obtaining critical dimension measurements of the opening that are within design specifications, much less assuring that obtained ADI-CDs are within design specifications, as does the claimed invention. Sedigh states, in column 24, lines 15-24:

CPU 88 is adapted to store the pre-etch values in a historical database within storage medium 86, determine a statistical result of the pre-etch values using program instructions within storage medium 86, and compare the statistical result to a target value for the one or more dimensional features of the semiconductor topography. As such, CPU 88 is adapted to adjust the etching parameters prior to etching the semiconductor typography if the statistical result of the pre-etch values is substantially different than the target value. (emphasis added)

In other words, deviations from the target results are used by the CPU to adjust the etch recipe, based on such deviations, to ensure that post-etch critical dimensions are within design specification. This is quite distinguished from producing pre-etch CD's that are in spec and preclude the need to customize the etch process. Sedigh accepts the pre-etch CD data as an input parameter and does not attempt to control this ADI-CD

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input parameter but rather, uses whatever pre-etch critical dimension measurement is obtained, to customize the etch recipe as necessary.

FIG. 9. of Sedigh does not include any feedback mechanism for assuring that ADI-CD's are within specification limits. In particular, Sedigh does not include any
5 feedback mechanism pointing back to step 90: Measure pre-etch values or to step 92: Process pre-etch values and nothing in Sedigh suggests any feed back to either of these steps.

Sedigh rather approaches the problem of controlling critical dimensions of the etched material, not the opening created through the layer of etch resist (photoresist)
10 material as in the claimed invention. Figure 8 of Sedigh shows that the only feedback mechanism to be arrows pointing to Semiconductor Processing Tool 82 from the CPU 88 and the Measurement device 84 and Applicants point out that Semiconductor Processing Tool 82 is clearly limited to being an etching system as defined throughout the specification including column 24 , lines 15-24, supra, and as explicitly taught in col.
15 23, lines 3-18 which state:

Semiconductor processing tool 82 may be any wet or dry etching tool commonly known in the art, which is adapted to etch the semiconductor topography using adjustable etching parameters. In addition,
20 semiconductor processing tool 82 may be a batch etching tool (i.e., to process several semiconductor wafers at once) or a single wafer etching tool (i.e., to process a single semiconductor wafer at once). For example, semiconductor processing tool 82 may be one of several plasma etching tools commonly used in the semiconductor industry, such as DRM or SCCM from Tokyo Electron Limited, eMAX or Super-E from Applied
25 Material, or Excelan from LAM Research. Note, however, that semiconductor processing tool 82 is not limited to the plasma etching tools listed above, and may alternatively include in any other wet or dry etching tool.

The only feedback in Sedigh is directed to the etching system where etching
30 parameters may be adjusted. In sharp contrast, the present invention provides the advantage and is distinguished from Sedigh because the claimed invention provides means, including a feedback mechanism, for assuring that the Critical Dimension

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Measurements of the opening in the photoresist, i.e., the ADI-CD, is within design specification. The present invention *actively controls* the ADI-CD with the claimed feedback means. Sedigh does not even address this issue.

- Amended independent claim 8 is therefore distinguished from Sedigh.
- 5 Dependent claim 9 was amended for consistency with the amendment to claim 8. Dependent claims 9-11 are therefore also distinguished from Sedigh and the rejection of claims 8-11 under 35 U.S.C. § 102(e) as being anticipated by Sedigh should be withdrawn.

III. Newly Added Claims

- 10 Independent claims 15 and 16 as well as dependent claim 17, have been added to point out further distinguishing features of Applicants' invention.

- Independent claim 15 points out the feature that the opening created through the layer of insulation material has non-linear sidewalls. The reference of Sedigh does not disclose or suggest this feature and the only figures of Sedigh that illustrate the
- 15 openings, i.e., FIGS. 3-6, clearly show straight, i.e. linear sidewalls. Claim 15 is believed to be distinguished from the references of record and in allowable form.

- Independent claim 16 points out the feature of means, including a feedback mechanism, for creating an opening . . . such that the opening has a critical dimension measurement that is within design specification. Neither of the references of record
- 20 disclose this feature and therefore Applicants respectfully submit that claims 16 and 17 are distinguished from the references and in allowable form.

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CONCLUSION

Based on the foregoing, each of claims 8-17 is in allowable form and the application is therefore in condition for allowance, which action is respectfully and expeditiously requested.

5 The Assistant Commissioner for Patents is hereby authorized to charge any additional fees or credit any excess payment that may be associated with this communication to Deposit Account 04-1679.

Respectfully submitted,



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